Abstract for 7th Symposium on Frequency Standards and Metrology. Asilomar Conference Center in Pacific Grove, California, USA , October 5 – 11, 2008.

Time keeping when gravitational effects are more than mere trifles

Daniel Kleppner
Department of Physics, Research Laboratory of Electronics,
and MIT-Harvard Center for Ultracold Atoms
MIT, Cambridge, Massachusetts

The precision of atomic clocks has increased ten-fold every decade since the 1950s. Although exponential progress inevitably levels off, it is reasonable to assume that significant advances in precision will continue for a few more decades. If so, it will no longer be possible to treat gravitational effects as minor corrections and time keeping will be propelled into a world ruled by General Relativity. This will ultimately require reconsideration of the concepts of clock synchronization, time transfer, and time itself.